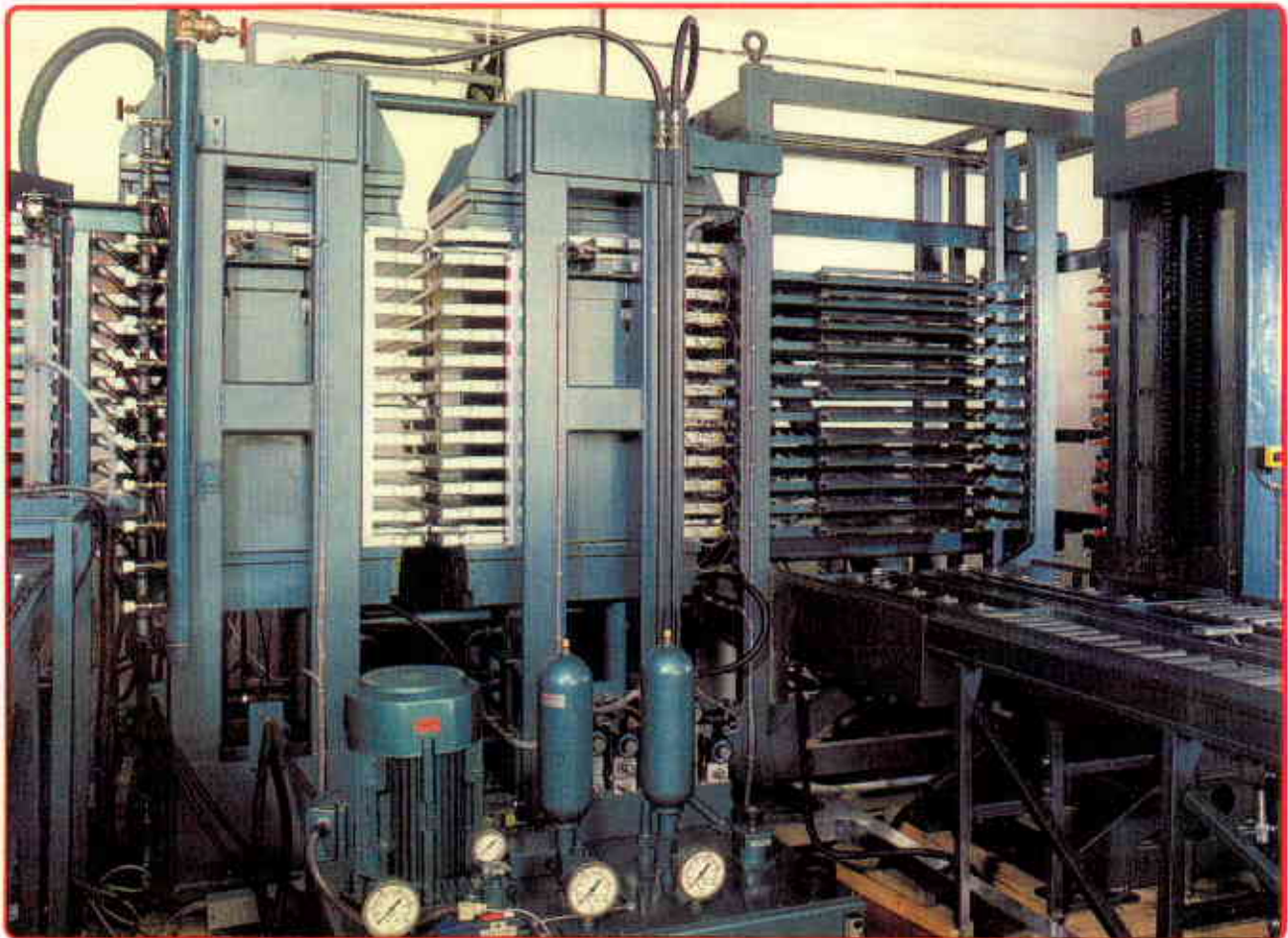


**oakwood
design**

Lamination Presses for Bank Card & Printed Circuit Board Production



TWIN STACK LAMINATOR – 12 DAYLIGHTS



THE QUEEN'S AWARD FOR
EXPORT ACHIEVEMENT

- **High technology electronic control**
- **4-Ram hydraulics for even pressure**
- **High efficiency alloy platens**
- **Over 40 models to suit all applications**
- **Fitted with automatic product handling systems**
- **From 1000 – 50,000 cards/hour**

INTRODUCTION

Oakwood is today the acknowledged world leader in the design and manufacture of specialist equipment for the production of P.V.C. banking, credit and commercial cards.

A major stage of card production is the lamination of the P.V.C. cards and Oakwood has over 6 years developed a complete range of high technology lamination presses to meet the specific needs of this industry.

Since their introduction in 1985, the numbers of machines now offered represents the largest available from any manufacturer.

Oakwood innovation has for the last 3 years been applied in the Printed Circuit Board Industry to develop a range of presses to satisfy the lamination needs of increasingly sophisticated multilayer P.C.B.'s. A number of features are common to both P.V.C. and P.C.B. presses, however specific needs are recognised and some key areas of construction, heating and cycle control are unique to each range.

Features Include:-

- i. – A range of 40 different models
- ii. – Integral hot/cold single stack presses or hot and cold twin stack transfer presses
- iii. – Full, programmable electronic system control
- iv. – Productivity
 - up to 50,000 cards per hour P.V.C.
 - up to 60 sq,m/hr P.C.B.
- v. – Complete materials layup/handling systems designed to suit applications.
- vi. – Vacuum facilities (P.C.B.) Vacuum assisted lamination is available on all Oakwood presses.



SS65/2 P.C.B. PRESS

DESIGN FEATURES

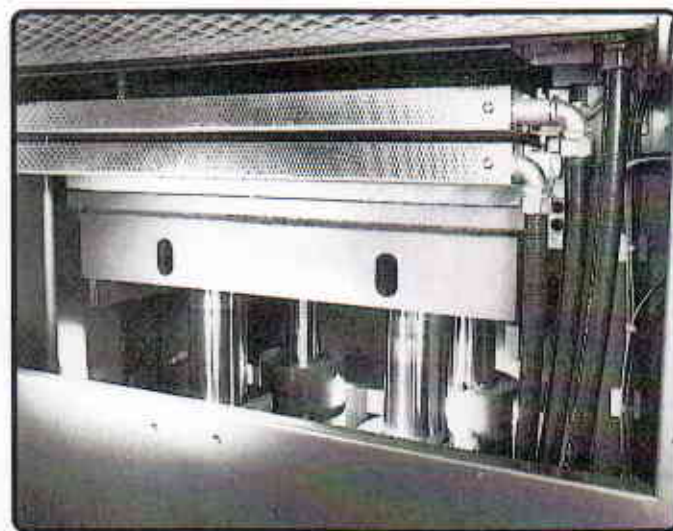
Construction

The machine's construction is based on a heavy, stress relieved welded steel frame to maintain rigidity and reduce distortion to a minimum. The top and bottom bolsters are removable for future maintenance.

4-Ram Hydraulics

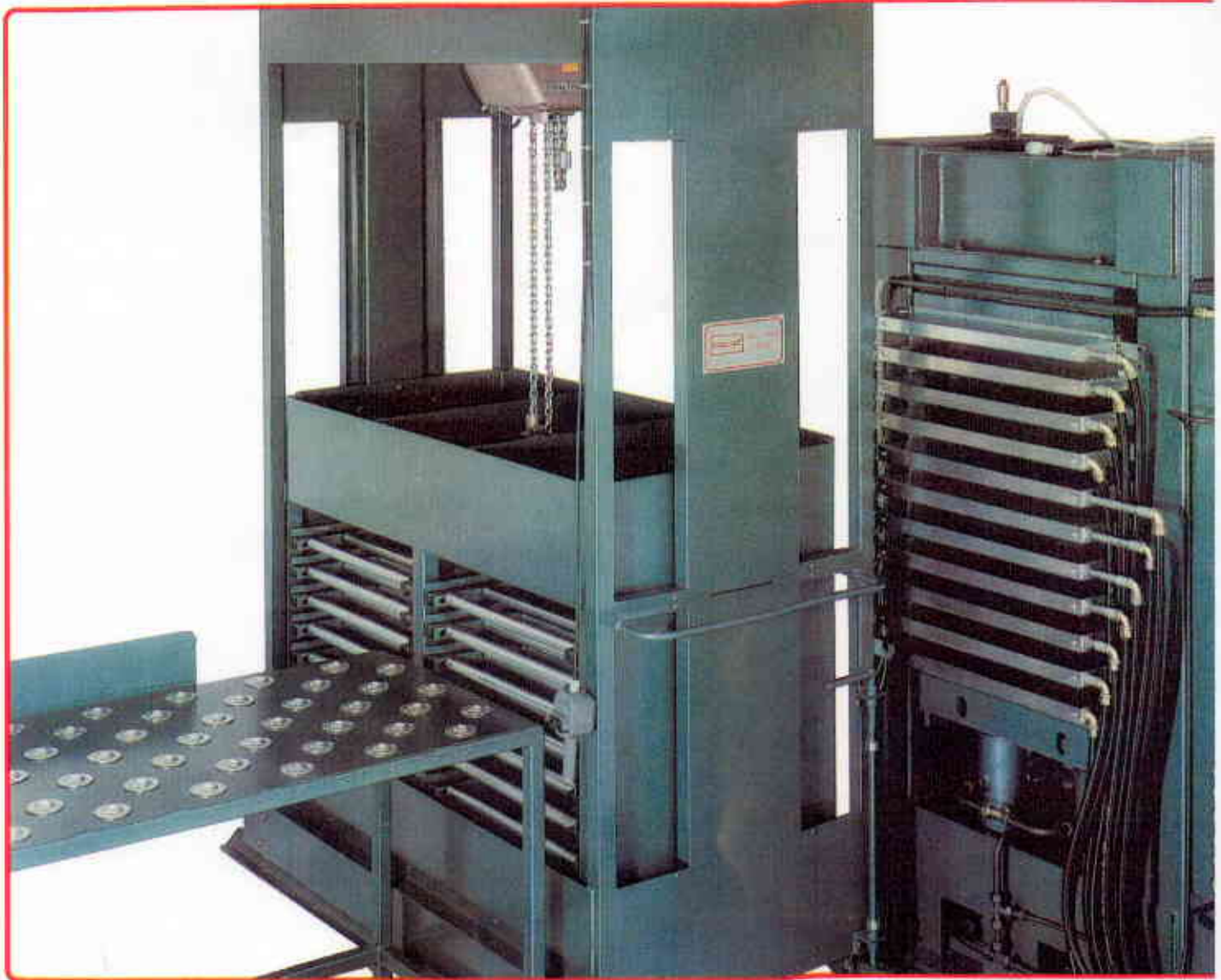
A fundamental feature of the Oakwood press is the 4 – Ram Hydraulic system which has a number of significant benefits;

- i. Precise, uniform pressure distribution over the whole platen eliminating pressure losses at the edges and corners.
- ii. The 4-Ram system allows self levelling platens so that even contact across the surface of the product is always achieved. This is one of the features that minimises distortion and ensures a uniform product thickness.
- iii. All stresses on the press structure are spread more evenly reducing the possibility of 'deflection.'
- iv. The hydraulic system is of a self balancing design ensuring that the pressure in each ram is automatically equal.



Hydraulic Power Pack

The hydraulics are switched off when the pressure level is reached to save energy and reduce noise. The closed loop electronic pressure control system maintains $\pm 2\%$ of range during lamination. For low pressure applications an optional dual pressure hydraulic pack can be supplied having two separate low and high pressure ranges. The separate hydraulic pack allows easy accessibility and maintenance.



SS50 10 DAYLIGHT SINGLE STACK PRESS WITH LOADER

SINGLE STACK PRESSES

Single stack presses allow maximum cycle control for lamination of medium production volumes.

The models from SS10 to SS60 are all supplied with semi-automatic loading equipment and a fully automatic transfer load system is available as an option. The range covers most requirements but alternative platen sizes can be supplied subject to specification.

Construction Standards

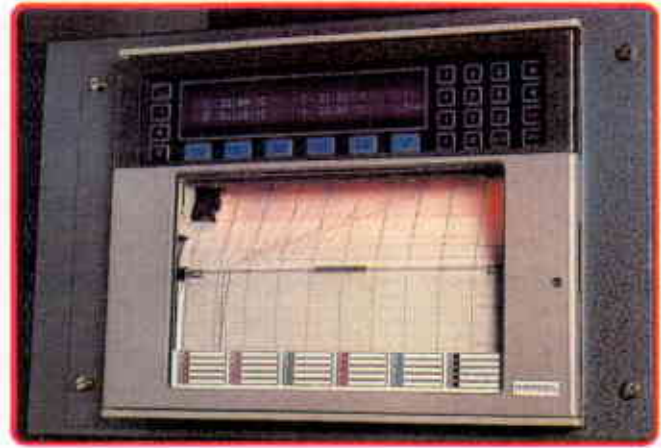
All machines meet EEC and recognised international safety requirements for construction, with safety interlocks, pressure relief valves and emergency stop buttons. Guards are fitted where required. Further safety features can be added on request.

| Model Series | Platen Size | Cards Per Sheet | Lamination Area | Day-Lights | Circa Power |
|--------------|--------------|-----------------|-----------------|------------|-------------|
| SS10 | 1070 x 760mm | 80 to 100 | 1070 x 728mm | 10 | 210kw |
| SS20 | 1070 x 760mm | 80 to 100 | 1070 x 728mm | 6 | 140kw |
| SS30 | 840 x 660mm | 60 to 80 | 840 x 628mm | 10 | 210kw |
| SS40 | 840 x 660mm | 60 to 80 | 840 x 628mm | 6 | 140kw |
| SS50 | 660 x 600mm | 40 to 60 | 628 x 600mm | 10 | 140kw |
| SS60 | 660 x 600mm | 40 to 60 | 628 x 600mm | 6 | 100kw |
| SS65/4 | 660 x 600mm | 40 to 60 | 628 x 600mm | 4 | 85kw |
| SS65/2 | 660 x 600mm | 40 to 60 | 628 x 600mm | 2 | 55kw |
| SS70 | 485 x 450mm | 20 to 25 | 453 x 450mm | 6 | 64kw |
| SS80 | 485 x 450mm | 20 to 25 | 453 x 450mm | 4 | 50kw |
| SS90 | 485 x 450mm | 20 to 25 | 453 x 450mm | 2 | 36kw |

OPTIONS

Chart Recorder

A chart recorder with data logger is available on all models and includes alarms, scales, dot matrix printer – 6 colours and 10 inch chart width. This can record all cycles for production records and can have free channels available for testing/development work.



Heater Alarm System

An electronic visual alarm system is available on all models to indicate any heater failure or substantial reduction in performance. A series of L.E.D's are checked at the beginning and end of each cycle and pinpoint any problem within 4 or 5 heaters. Platen design allows easy removal and replacement of heater elements for minimum 'down' time.

Computer Control

Oakwood have recently developed a system of full interactive computer control for use with P.C.B. presses using Oakwood software to achieve:-

- i. Full programming capacity to suit product requirements. Variable heating and cooling rates and up to 10 pressure stages per cycle.
- ii. Full control of all press functions with storage of pre-programmed cycles.
- iii. "User friendly" menu driven programme with Operator and Supervisor modes.
- iv. Product Protection, products which must run on a particular cycle are prevented from being run on any other in error.
- v. Graphics presentation/Data logger Plotted v Actual Cycle profile. Allows checking of how closely the ideal cycle was achieved.
- vi. Link to overall factory control system.



REAL TIME DISPLAY MONITORING
ALL FUNCTIONS DURING LAMINATION.

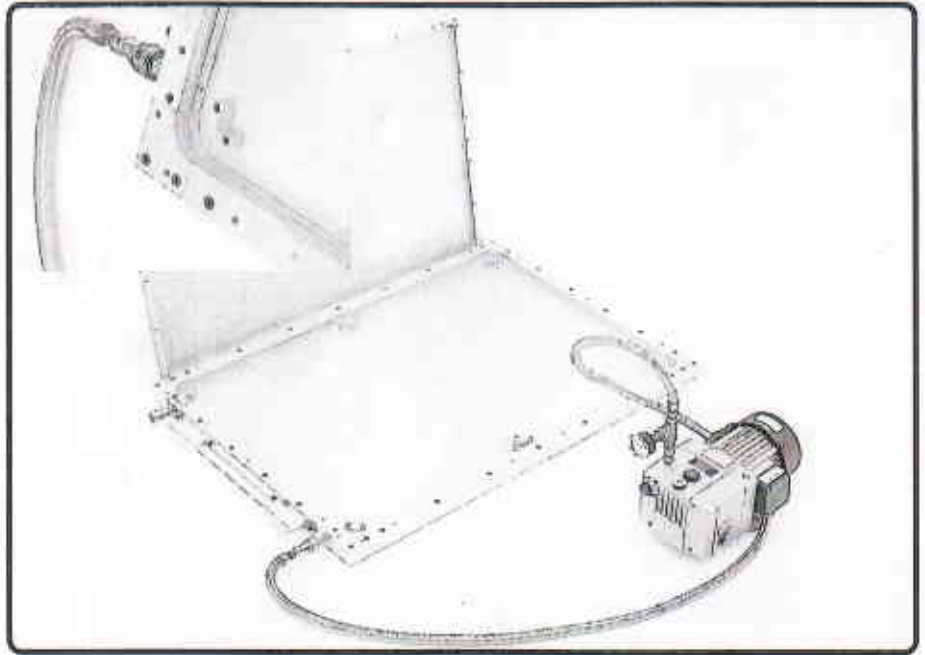


GRAPHICS DISPLAY PROVIDES A CHECK
FOR NEWLY PROGRAMMED CYCLES.

Vacuum Lamination for P.C.B. Production

Oakwood offers two options on all P.C.B. presses achieving up to 29 inches Hg (30 mbar) in under 2 minutes.

- i. Vacuum chambers can be fitted to single stack hot/cold presses or twin stack hot/cold transfer presses. These require minimum of handling and maintenance and operate automatically as part of the overall cycle.
- ii. Vacuum trays can achieve a higher level of vacuum due to their small volume and can be evacuated before insertion into the press. Trays are only used as required and therefore have greater flexibility.

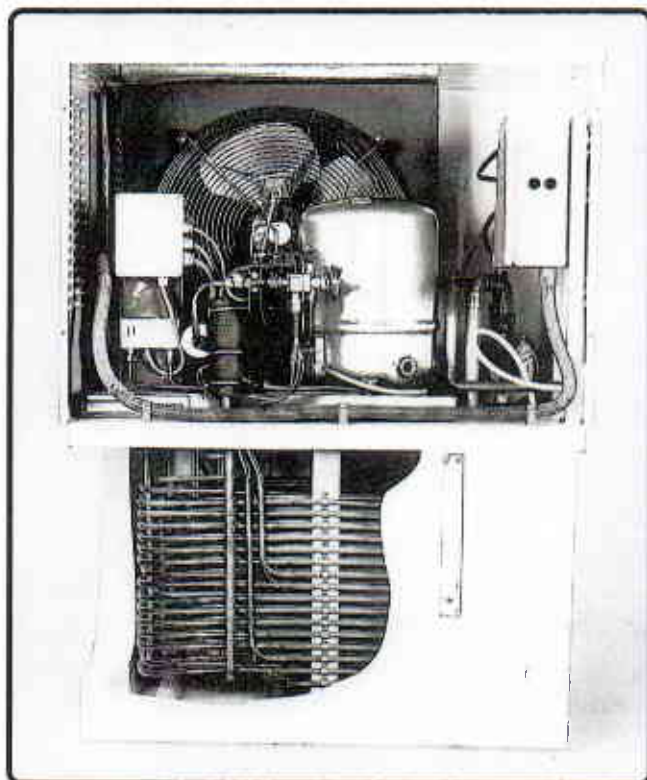


Handling/Layup Systems

All the larger automated presses are supplied with handling, load and unload systems to operate at full efficiency. However, Oakwood is able to supply materials handling systems to customer specifications if required. These typically include additional motorised conveyors, storage buffers & product lifting and placement equipment.

Chiller Units

Cycle times and productivity are partly dependent upon the temperature of the cooling water used. Each model of press can be supplied with a compatible tank and chiller unit to form a closed loop system supplying water at the optimum temperature. They are supplied complete with low level alarms, remote control switching, thermostatic control pumping gear and valves.



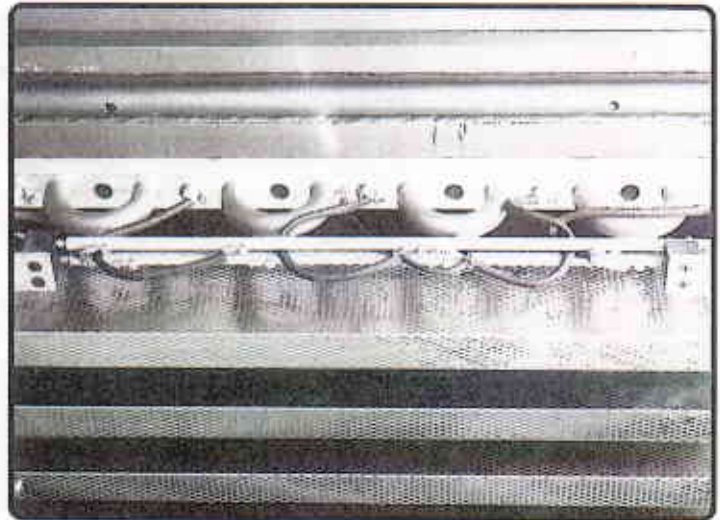
WATER CHILLERS

| Laminator Model | Buffer Tank Litres | Chiller Model | Laminator Model | Buffer Tank Litres | Chiller Model |
|-----------------|--------------------|---------------|-----------------|--------------------|---------------|
| SS10 | 5000 | RCU 9 | TS10 | 1350 | RCU10 |
| SS20 | 3000 | RCU10 | TS20 | 1350 | RCU 9 |
| | | | TS25 | 680 | RCU 8 |
| SS30 | 3000 | RCU11 | | | |
| SS40 | 3000 | RCU 9 | TS30 | 1350 | RCU 9 |
| | | | TS40 | 1350 | RCU 9 |
| | | | TS45 | 680 | RCU 8 |
| SS50 | 3000 | RCU 9 | | | |
| SS60 | 3000 | RCU 8 | TS50 | 680 | RCU 8 |
| | | | TS60 | 680 | RCU 8 |
| SS70 | 1350 | RCU 8 | TS65 | 680 | RCU 7 |
| SS80 | 680 | RCU 7 | | | |
| SS90 | 680 | RCU 5 | TS70 | 320 | RCU 6 |
| | | | TS75 | 320 | RCU 5 |

Alloy Platen – Construction

The alloy used in the construction of Oakwood platens has a conductivity 3x that of steel. This provides substantial benefits over conventional construction.

- i. Heat distribution – the high conductivity provides a uniform temperature over the platen surface as any small temperature irregularities are evened out.
- ii. Controllability – The platen material is very responsive to demands from the control system in heat up and cool down cycles.
- iii. High conductivity – 'slim line' (40mm) platens ensure heat is transferred efficiently into the product stack allowing higher stacks to be laminated, e.g.
Standard build P.V.C. – 10 sheets of bank card thickness per daylight.
Standard build P.C.B. – 10 layers of multilayers 1.6mm thickness per daylight.
- iv. High thermal efficiency Oakwood platens use substantially less energy than conventional materials.
- v. Cold Start facility (P.C.B.) – due to the alloy platens the Oakwood Presses are capable of laminating from ambient temperature and achieving controlled heat-up rates specified by P.C.B. materials. This design gives temperature curves near the ideal required for pre-pregs.



Heating and Cooling

Platens are heated using precision electric cartridges to provide the most controllable and efficient heating with minimum maintenance. A range of heaters are used depending upon the machine model to balance economy with performance.

Water cooling is achieved using replaceable, sacrificial copper tubes integral to the platens. These are designed to provide uniform cooling and require minimal maintenance as water is not in direct contact with the platens, eliminating the possibility of corrosion or erosion.

Cycle Control – P.V.C.

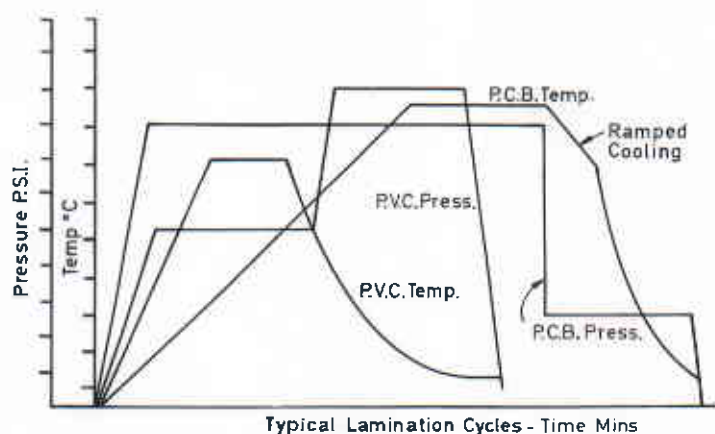
Oakwood has developed a unique lamination cycle for the highest quality bank and credit card manufacture producing a well laminated structure whilst eliminating print distortion and surface defects. The temperature of all platens is controlled individually to provide uniform heating throughout the press. Manual controls are also provided for testing/maintenance work.

Cycle Control – P.C.B.

Oakwood P.C.B. presses have inherited the best features of the P.V.C. lamination technology and have in addition heating and cooling rate controls to achieve temperature profiles required by pre-pregs. This allows a variety of types of boards to be bonded including Epoxy, Polyimide, BT resin, flexibles, heat sinks etc.

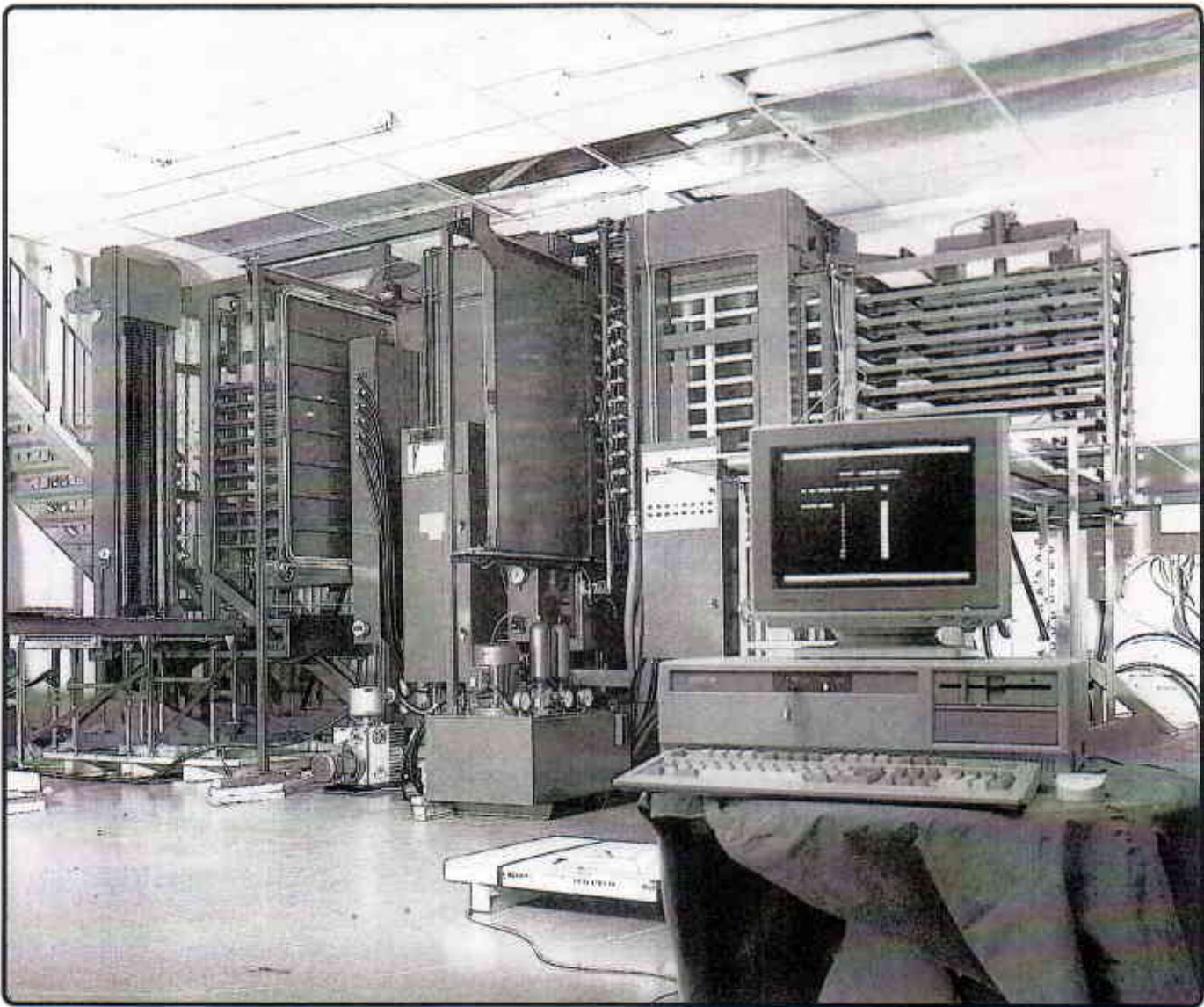
Heating rates are controlled by means of electronic P.I.D. controllers, cooling rates via the Oakwood vapour injection system integral to the platens.

VAPOUR INJECTION SYSTEM – This has been developed by Oakwood to ensure controlled adjustable cooling rates providing stress free P.C.B.'s without any bow and twist. Air and water is mixed in adjustable proportions and injected into the platens at a rate determined by the P.I.D. control to achieve the programmed cooling rate.



P.V.C.

P.C.B. Cycle Curves



10 DAYLIGHT 30" x 42" P.C.B. TWINSTACK WITH VACUUM CHAMBER

Twin Stack Presses

For maximum productivity and minimum labour content, the fully automatic Oakwood in-line transfer press is recommended. This has a 12-16 minute cycle time for P.V.C. cards and with dedicated Hot and Cold presses a considerable energy saving can be achieved. All machines are supplied with complete handling systems and include – layup stations, infeed and outfeed conveyors, automatic loading, tray transfer and unload station.

Product stacks are assembled on specially designed Oakwood carrier trays which ensure centralisation of the product within the press. Each tray is then loaded, laminated and unloaded completely automatically back to the operator layup stations.

P.C.B. Twin Stack

A further option for the P.C.B. version of the Twin Stack is the ability of the hot stack to pre-cool the product before transfer to reduce the thermal shock and provide further quality improvement. This feature can combine the controllability of a Single Stack machine with a high output of a Twin Stack.

| Model Series | Platen Size | Bank Cards Per Sheet | Lamination Area | Day-Lights | Circa Power |
|--------------|--------------|----------------------|-----------------|------------|-------------|
| TS10 | 1070 x 760mm | 80 to 100 | 1070 x 728 | 12 | 250kw |
| TS20 | 1070 x 760mm | 80 to 100 | 1070 x 728 | 9 | 190kw |
| TS25 | 1070 x 760mm | 80 to 100 | 1070 x 728 | 6 | 140kw |
| TS30 | 840 x 660mm | 60 to 80 | 840 x 628 | 12 | 250kw |
| TS40 | 840 x 660mm | 60 to 80 | 840 x 628 | 9 | 190kw |
| TS45 | 840 x 660mm | 60 to 80 | 840 x 628 | 6 | 140kw |
| TS50 | 660 x 600mm | 40 to 60 | 628 x 600 | 12 | 170kw |
| TS60 | 660 x 600mm | 40 to 60 | 628 x 600 | 9 | 130kw |
| TS65 | 660 x 600mm | 40 to 60 | 628 x 600 | 6 | 100kw |
| TS70 | 485 x 450mm | UP TO 24 | 453 x 450 | 9 | 100kw |
| TS75 | 485 x 450mm | UP TO 24 | 453 x 450 | 6 | 80kw |

Series 6 Benchtop Presses

Oakwood also manufacture a versatile range of benchtop laminators. These highly developed and technically advanced machines include processor control to define precise settings required to produce consistent high quality results. Electrically heated, mechanical or hydraulically powered, air and water cooled the range incorporates many of the features of the larger machines without compromising quality for size. The range includes 7 laminators to ensure a solution is available for every project.

An additional brochure is available for the series 6 range.



SERIES 6D MACHINE

| Model | Cards per Cycle | Day lights | Cycle (mins) | Platen size | Water Cooled | Typical Applications |
|-------|-----------------|------------|--------------|-------------|--------------|---------------------------------------|
| 6A | 5 | 1 | 5 to 8 | 107x148mm | Optional | Small ID systems & laboratory testing |
| 6B | 10 | 1 | 6 to 9 | 123x160mm | Optional | National ID systems |
| 6D | 48 | 1 | 10 to 12 | 220x309mm | Standard | Small scale sheet laminator |
| 6E/2 | 216 | 2 | 12 to 15 | 410x309mm | Standard | Professional laminator |
| 6E/3 | 324 | 3 | 12 to 15 | 410x309mm | Standard | Professional laminator |
| 6F/2 | 576 | 2 | 14 to 18 | 520x420mm | Standard | Professional laminator |
| 6F/3 | 860 | 3 | 14 to 18 | 520x420mm | Standard | Professional laminator |



PROFILE OF OAKWOOD DESIGN

Oakwood are engineers specialising in the development of automation techniques for industry. Founded in 1977 by development engineers, the company has used its considerable experience in microprocessor and electronics technology to develop special purpose equipment for greater manufacturing efficiency and improved product quality in a variety of industries.

The company now employs a large staff of highly qualified engineers with a wide experience of technical and industrial problems. Systems design and development has included equipment for industries where the resulting increases in efficiency has brought significant benefits to Oakwood customers.

All machines use the benefits of microprocessor controls, designed to produce consistently high quality products with very low labour, space and service requirements. Unit cost savings of 30 to 70% are quite realistic and typical of the benefits of the savings achieved by Oakwood automation processing techniques.

Major international success has been achieved in the development of a range of equipment for the production of plastic cards as used in bank and credit card manufacturing. In this industry manufacturing techniques had not changed dramatically for over 20 years. Research led to the development of a range of over 50 machines which have made Oakwood rank as the world leader in the industry and resulted in winning the Queens Award for Export Achievement in 1987.



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